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## C-A OPERATIONS PROCEDURES MANUAL

### 12.60 TtB Operations with Light Ions (m<Carbon)

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#### Hand Processed Changes

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Approved: \_\_\_\_\_ *Signature on File* \_\_\_\_\_  
Collider-Accelerator Department Chairman Date

C.Carlson

## **12.60 TtB Operations with Light Ions (m<Carbon)**

### **1. Purpose**

The purpose of this procedure is to define the steps required to operate TtB with (Light Ions)

### **2. Responsibilities**

It is the responsibility of the person or persons executing this procedure to observe all safety rules.

### **3. Prerequisites**

3.1 Prior to accelerating light ions:

- 3.1.1 MP6 or MP7 to be in the (Light Ion Mode) as per [C-A-OPM 12.57 “TtB Ion Source \(Light Ion\) Startup”](#)
- 3.1.2 TtB to be swept and secured
- 3.1.3 All MP-6 and MP-7 zones to be set

### **4. Precautions**

For deuteron running into TtB, the terminal voltage shall be limited to 6 MV or less. The average intensity must be kept below 200 nA. 12MW30 must be inserted for monitoring light ions in TtB

All accelerator room zones must be set when control room shielding door is closed.

### **5. Procedure**

5.1 ALARA Guidelines

- 5.1.1 Whenever possible, the TtB line should first be tuned with a heavier beam of the same rigidity as the light ion beam.
- 5.1.2 Transport of light ion beam into TtB should be minimized. Beam should be stopped in the accelerator room, preferably at the low energy cup, unless it is being used for TtB tuning or Booster injection. Setup or studies should be done at lower average intensity whenever possible (reduce the pulse width and/or rep rate).
- 5.1.3 When running light ions the use of Faraday cups and harps in TtB should be minimized. Take care that a TtB harp is not left inserted after a measurement is made. (excluding the 12-30 harp, which must remain inserted for light ion running).

- 5.2 Limitations for Deuterium in TtB
  - 5.2.1 The terminal voltage shall be limited to 6 MV or less.
  - 5.2.2 The average intensity must be kept below 200 nA including trace, but normal operation should not exceed 100 nA including trace. (For example, < 200 uA pulsed intensity at 250 uS beam width, and 6 pulses every 3 seconds)
  - 5.2.3 The beam profile at the 12MW30 harp is used to continuously monitor light ion beam intensity in the TtB line. The beam intercepted by the harp allows a proportional measurement of radiation produced by beam hitting the harp wires. When in the light ion mode, this harp must be inserted before the security system allows the low energy beam stops to be opened
  - 5.2.4 The 11DH1 and 11DH2 current limiting devices to be set 10% above required current and their functionality tested.
- 5.3 12MW30 Harp Procedure
  - 5.3.1 Insert the 12FC165 cup here, to prevent beam from entering minimum shielding area of TtB
  - 5.3.2 The 12-30 harp must be set up for continuous monitoring on an analog oscilloscope in the Tandem control room.
  - 5.3.3 Observe the profile of 12MW30 when the light ion beam is first transported into TtB during an run cycle. Observe the first D beam injection into TtB after each Tandem operator shift change. The following should be checked:
    - 5.3.3.1 The beam profile should be hitting at least 5 harp profile channels in each plane. It is desirable that the beam not hit the harp frame, since this will result in the security system putting in beam stops at a lower current than required.
    - 5.3.3.2 If the beam hits less than 5 harp wires in each plane or hits the frame, the 11-30 cup should be inserted and the upstream tune should be verified by checking that power supplies are at their proper values, and that beam profiles are as expected. Beam intensity should then be reduced to less than 20 nA average current, the 11-30 cup retracted and the profile 12MW30 observed. Some tuning may be required to restore the beam to a satisfactory size and position at 12MW30. If so, record all changes in the Tandem logbook. If problems persist, insert the beamstops and contact the Tandem Operations Supervisor or his designee.

- 5.3.4 There should be no more than 2 channels missing. Record missing channels in operations log.
- 5.3.5 If more than 2 channels are missing, insert the beam stops, and then perform a test of the harp electronics. If there is a problem with the electronics, the unit must either be repaired or replaced before continuing. If all electronics seem to be OK, the problem could be broken harp wires. The Tandem Operations Supervisor or his designee should be consulted regarding possible replacement of the harp.

## 6. **Documentation**

- 6.1 TVDG Operators to record appropriate information in TVDG Operations Log Book as required by this procedure.

## 7. **References**

- 7.1 [C-A-OPM 12.57 “TtB Ion Source \(Light Ion\) Startup”](#).

## 8. **Attachments**

None